

Claims

- [c1] 1. An antenna system for a mobile terminal having a movable cover, the antenna system comprising:
a radio frequency (RF) interface to connect the antenna system to the mobile terminal;
a radiating element; and
a switchable matching arrangement disposed between the RF interface and the radiating element, wherein the switchable matching arrangement is operable to switch the antenna system into a first matched condition when the movable cover is in a first position, and into a second matched condition when the movable cover is in a second position.
- [c2] 2. The antenna system of claim 1 wherein the switchable matching arrangement further comprises:
a single matching network; and
a switch responsive to the position of the movable cover to connect the single matching network to the radiating element achieve one of the first matched condition and the second matched condition and to disconnect the single matching network from the radiating element to achieve the other of the first matched condition and the

second matched condition.

[c3] 3. The antenna system of claim 1 wherein the switchable matching arrangement further comprises:
a first matching network and a second matching network; and
a switch responsive to the position of the movable cover to connect the first matching network to the radiating element to achieve one of the first matched condition and the second matched condition and to connect the second matching network to the radiating element to achieve the other of the first matched condition and the second matched condition.

[c4] 4. The antenna system of claim 1 wherein the switchable matching arrangement further comprises:
a first feed point and a second feed point; and
a switch responsive to the position of the movable cover to connect the RF interface to the radiating element at the first feed point to achieve one of the first matched condition and the second matched condition and to connect the RF interface to the radiating element at the second feed point to achieve the other of the first matched condition and the second matched condition.

[c5] 5. The antenna system of claim 1 wherein the switchable matching arrangement further comprises:

an RF connection between the RF interface and the radiating element;
a switchable ground connection; and
a switch responsive to the position of the movable cover to connect the switchable ground connection to the radiating element to achieve one of the first matched condition and the second matched condition and to disconnect the switchable ground connection from the radiating element to achieve the other of the first matched condition and the second matched condition.

[c6] 6. The antenna system of claim 1 wherein the radiating element can be extended and collapsed, and wherein: the first matched condition and the second matched condition are achieved when the radiating element is extended; and
the switchable matching arrangement is further operable to switch the antenna system into a third matched condition when the movable cover is in the first position and the radiating element is collapsed, and into a fourth matched condition when the movable cover is in the second position and the radiating element is collapsed.

[c7] 7. The antenna system of claim 1 wherein:
the first matched condition and the second matched condition are achieved when the mobile terminal is in one of a transmit mode and a receive mode; and

the switchable matching arrangement is further operable to switch the antenna system into a third matched condition when the movable cover is in the first position and the mobile terminal is in the other of the transmit mode and the receive mode, and into a fourth matched condition when the movable cover is in the second position and the mobile terminal is in the other of the transmit mode and the receive mode.

[c8] 8. The antenna system of claim 1 wherein:
the first matched condition and the second matched condition are achieved when the mobile terminal is operating in one frequency band; and
the switchable matching arrangement is further operable to switch the antenna system into a third matched condition when the movable cover is in the first position and the mobile terminal is operating in another frequency band, and into a fourth matched condition when the movable cover is in the second position and the mobile terminal is operating in the other frequency band.

[c9] 9. A mobile terminal comprising:
a movable cover;
transceiver components operable to transmit and receive communication signals;
a processing platform operable to control the transceiver components and to determine when the movable cover is

in a first position and a second position; and
an antenna system connected to the transceiver components, the antenna system further comprising a radiating element connected to a switchable matching arrangement which is responsive to the processing platform to switch the antenna system into a first matched condition when the movable cover is in the first position, and into a second matched condition when the movable cover is in the second position.

[c10] 10. The mobile terminal of claim 9 wherein the switchable matching arrangement further comprises:
a single matching network; and
a switch operable to connect the single matching network to the radiating element to achieve one of the first matched condition and the second matched condition and to disconnect the single matching network from the radiating element to achieve the other of the first matched condition and the second matched condition.

[c11] 11. The mobile terminal of claim 9 wherein the switchable matching arrangement further comprises:
a first matching network and a second matching network; and
a switch operable to connect the first matching network to the radiating element to achieve one of the first matched condition and the second matched condition

and to connect the second matching network to the radiating element to achieve the other of the first matched condition and the second matched condition.

[c12] 12. The mobile terminal of claim 9 wherein the switchable matching arrangement further comprises:
a first feed point and a second feed point; and
a switch operable to connect the transceiver components to the radiating element at the first feed point to achieve one of the first matched condition and the second matched condition and to connect the transceiver components to the radiating element at the second feed point to achieve the other of the first matched condition and the second matched condition.

[c13] 13. The mobile terminal of claim 9 wherein the switchable matching arrangement further comprises:
an RF connection between the transceiver components and the radiating element;
a switchable ground connection; and
a switch operable to connect the switchable ground connection to the radiating element to achieve one of the first matched condition and the second matched condition and to disconnect the switchable ground connection from the radiating element to achieve the other of the first matched condition and the second matched condition.

[c14] 14. The mobile terminal of claim 9 wherein the radiating element can be extended and collapsed, and wherein: the first matched condition and the second matched condition are achieved when the radiating element is extended; and the switchable matching arrangement is further operable to switch the antenna system into a third matched condition when the movable cover is in the first position and the radiating element is collapsed, and into a fourth matched condition when the movable cover is in the second position and the radiating element is collapsed.

[c15] 15. The mobile terminal of claim 9 wherein: the first matched condition and the second matched condition are achieved when the mobile terminal is in one of a transmit mode and a receive mode; and the switchable matching arrangement is further operable to switch the antenna system into a third matched condition when the movable cover is in the first position and the mobile terminal is in the other of the transmit mode and the receive mode, and into a fourth matched condition when the movable cover is in the second position and the mobile terminal is in the other of the transmit mode and the receive mode.

[c16] 16. The mobile terminal of claim 9 wherein:

the first matched condition and the second matched condition are achieved when the mobile terminal is operating in one frequency band; and
the switchable matching arrangement is further operable to switch the antenna system into a third matched condition when the movable cover is in the first position and the mobile terminal is operating in another frequency band, and into a fourth matched condition when the movable cover is in the second position and the mobile terminal is operating in the other frequency band.

[c17] 17. A method of operating a mobile terminal having a movable cover, the method comprising:
determining a position of the movable cover, wherein the movable cover is movable between at least a first position and a second position;
switching an antenna system comprising a radiating element into a first matching condition when the movable cover is in the first position;
switching the antenna system into a second matching condition when the movable cover is in the second position; and
engaging in telecommunication signaling through the antenna system.

[c18] 18. The method of claim 17 wherein the switching of the antenna system into the first matching condition and the

second matching condition are accomplished when the radiating element is in an extended state, and further comprising:

switching the antenna system into a third matching condition when the movable cover is in the first position and the radiating element is in a collapsed state; and

switching the antenna system into a fourth matching condition when the movable cover is in the second position and the radiating element is in the collapsed state.

[c19] 19. The method of claim 17 wherein the switching of the antenna system into the first matching condition and the second matching condition are accomplished when the mobile terminal is operating in one of a transmit mode and a receive mode, and further comprising:
switching the antenna system into a third matching condition when the movable cover is in the first position and the mobile terminal is operating in the other of the transmit mode and the receive mode; and
switching the antenna system into a fourth matching condition when the movable cover is in the second position and the mobile terminal is operating in the other of the transmit mode and the receive mode.

[c20] 20. The method of claim 17 wherein the switching of the antenna system into the first matching condition and the second matching condition are accomplished when the

mobile terminal is operating one frequency band, and further comprising:

switching the antenna system into a third matching condition when the movable cover is in the first position and the mobile terminal is operating in another frequency band; and

switching the antenna system into a fourth matching condition when the movable cover is in the second position and the mobile terminal is operating in the other frequency band.

- [c21] 21. A mobile terminal comprising:
- a movable cover movable between at least a first position and a second position;
 - an antenna system comprising a radiating element;
 - means for determining a position of the movable cover;
 - means for switching the antenna system into a first matching condition when the movable cover is in the first position;
 - means for switching the antenna system into a second matching condition when the movable cover is in the second position; and
 - means for engaging in telecommunication signaling through the antenna system.

- [c22] 22. The mobile terminal of claim 21 further comprising:
- means for determining when the radiating element is in

an extended state and a collapsed state;
means for switching the antenna system into the first matching condition and the second matching condition when the radiating element is in the extended state;
means for switching the antenna system into a third matching condition when the movable cover is in the first position and the radiating element is in a collapsed state; and
means for switching the antenna system into a fourth matching condition when the movable cover is in the second position and the radiating element is in the collapsed state.

[c23] 23. The mobile terminal of claim 21 further comprising:
means for switching the antenna system into the first matching condition and the second matching condition when the mobile terminal is in one of a transmit mode and a receive mode;
means for switching the antenna system into a third matching condition when the movable cover is in the first position and the mobile terminal is in the other of the transmit mode and the receive mode; and
means for switching the antenna system into a fourth matching condition when the movable cover is in the second position and the mobile terminal is in the other of the transmit mode and the receive mode.

[c24] 24. The mobile terminal of claim 21 further comprising:
means for switching the antenna system into the first matching condition and the second matching condition when the mobile terminal is operating on one frequency band;
means for switching the antenna system into a third matching condition when the movable cover is in the first position and the mobile terminal is operating on another frequency band; and
means for switching the antenna system into a fourth matching condition when the movable cover is in the second position and the mobile terminal is operating on the other frequency band.